Firm Market Power, Wage Rigidity and Demand-Determined Business Cycles*

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Abstract

The canonical business-cycle model with rigid wages assumes that workers have market power in setting wages ex ante and that firms choose hours ex post along a labor-supply schedule. Several recent papers invert this setup: firms have market power ex ante, and households choose hours ex post along a labor-demand schedule. While firm market power is consistent with ample empirical evidence of monopsonistic labor markets, supply-determined hours generate implausible predictions in models with realistic household heterogeneity (Auclert et al., 2023; Broer et al., 2020). Moreover, they conflict with the fact that business cycles are characterized by a large labor supply wedge (Karabarbounis, 2014).

We introduce a contracting model with firm market power, rigid wages, and demand-determined hours. Ex ante, firms post nominal wage contracts that survive probabilistically, Calvo-style, into the next period, taking a firm-specific labor-supply curve as given. Ex post, firms choose hours conditional on the wage contract and the realization of idiosyncratic shocks. We show that the degree of labor market power is irrelevant for business-cycle dynamics of output and inflation but shapes the dynamics of labor compensation. The importance of firm market power for compensation dynamics increases with the rigidity of wage contracts.

Keywords: Monopsony, wage rigidity, hours worked, New Keynesian, business cycles
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1 Introduction

Modern business-cycle models rely on nominal rigidities to generate demand-driven fluctuations. While early New Keynesian work emphasized sticky prices, the last two decades have made clear that *wage* rigidities are at least as important quantitatively (Erceg et al., 2000; Christiano et al., 2005). More recently, heterogeneous-agent New Keynesian models have sharpened the case: wage rigidity restores monetary transmission in environments where sticky prices alone can leave aggregate output essentially insulated from policy (Broer et al., 2020), and it provides a way to reconcile high marginal propensities to consume with near-zero marginal propensities to earn without implying implausibly large multipliers (Auclert et al., 2023). Further, a decomposition of the labor wedge shows that movements in the labor wedge are almost entirely driven by the worker intratemporal labor supply condition (Karabarbounis, 2014). Reflecting these developments, canonical HANK frameworks now often take wage stickiness as the sole nominal friction (Auclert et al., 2025).

At the same time, a growing literature studies how labor-market power shapes macroeconomic stabilization. Embedding monopsony or oligopsony into New Keynesian environments changes the mapping from demand shocks to wages, employment, and inflation, with implications for the transmission of fiscal and monetary policy (Bredemeier et al., 2025; Bardóczy et al., 2025; Dennery, 2020; Alpanda and Zubairy, 2021). Yet the way wage rigidities are typically introduced into these monopsonistic settings differs in a subtle but consequential respect from the role that wage rigidity plays in the arguments above. In many monopsony models, firms set wages while workers choose hours along an intratemporal labor-supply margin, so the household's marginal rate of substitution continues to govern hours worked. As a result, these models remain *supply-determined* in the short run. We revisit the arguments in favor of wage rigidities put forth in Auclert et al. (2023), Broer et al. (2020), and Karabarbounis (2014) and show that, in a monopsony environment, matching basic business-cycle facts requires workers to be off their short-run labor-supply curve.

This paper proposes an alternative, contract-based model of rigid wages under monopsony. We build on Broer et al. (2023) and combine two ingredients. First, labor markets are monopsonistically competitive in the empirically motivated sense of Card et al. (2018): firms face an imperfectly elastic labor supply because workers have idiosyncratic preferences over employers. Second, wage payments are governed by rigid nominal wage *contracts* that specify wage payments as a function of hours worked and remain in force for the duration of a match. Crucially, after a match is formed and a contract is in place, the firm chooses hours ex post. In this environment, workers can be off their labor-supply curve in the short run because the contract shifts the intensive-margin decision to the firm; output is demand determined in the sense of Barro and Grossman (1971).

With Calvo-style rigidity in contract duration, our contracting environment generalizes the canonical model of rigid wages (Erceg et al. (2000), EHL). As in EHL, hours worked are demand determined, and the model generates a New Keynesian wage Phillips curve that shares many properties with the canonical rigid-wage model. In particular, contractionary monetary policy shocks and positive productivity shocks generate deflationary pressures, in contrast to models with supply-determined hours.

However, by allowing wage contracts to specify a *schedule* of payments as a function of hours—rather than a constant hourly wage—we open up the possibility of separating the level of wage payments from the marginal wage. At hiring, the worker's net present value of the match is allocative on the extensive margin. Once hired, the worker receives wage compensation as a function of hours worked, and the marginal wage remains allocative on the intensive margin. Total wage compensation therefore depends not only on the marginal wage but also on the level of contractual payments (installments). In terms of measured wage payments, the model combines Barro (1977)'s irrelevance result—where "base wage" payments reflect installments in a long-term contract—with a rigid-wage environment in which the "marginal wage" remains allocative.

Using the model, we derive two predictions regarding how firm market power affects business-cycle dynamics. First, we show an irrelevance result: in our setting, the degree of firm market power has no effect on the equilibrium dynamics of quantities (employment and output). Second, firm market power does affect the dynamics of labor compensation (e.g., the labor share), and this effect becomes more pronounced as wage rigidity increases.

More broadly, our framework disentangles how (and by whom) wages are set from how (and by whom) hours are chosen. Whereas much of the previous literature implicitly assumes that the party who does not set the wage must choose hours, our framework shows that this need not be the case.

The remainder of the paper lays out the model, characterizes equilibrium, and illustrates the implications for business-cycle dynamics and policy transmission in a monopsonistic economy with rigid wage contracts.

2 Business-cycle models require workers off their labor supply curves

We begin by revisiting the most transparent version of the New Keynesian monopsonistic labor market model, where firms set wages and workers choose hours worked—a supply-determined labor market—and relate it to the arguments in Broer et al. (2020), Auclert et al. (2023), and Karabarbounis (2014). We show that a monopsony framework consistent with basic business-cycle facts requires workers to be off their short-run labor-supply curve.

The supply-determined New Keynesian monopsony model — The model in Dennery (2020) is a useful benchmark for organizing the issues because it describes the simplest three-equation New Keynesian model with monopsony in the labor market.

The model features monopsonistic competition in the labor market: each firm faces an upward-sloping labor supply curve because workers view jobs as imperfect substitutes (formally, labor is a CES aggregate across employers). Firms therefore have wage-setting power and optimally pay a wage that is marked down relative to the marginal product of labor.

Crucially, households in Dennery (2020) choose hours on an intratemporal margin. At the aggregate level, the real wage Ω_t equals the marginal rate of substitution between consumption and labor,

$$\Omega_t = MRS_t,$$

while nominal wage rigidity is imposed on the *firm's* wage-setting problem. This generates what Dennery calls a "monopsonistic Phillips curve" with an inverted sign: wage inflation is *negatively* related to the employment/output gap. When firms cannot fully raise nominal wages in response to inflation, the real wage falls. With households on their labor supply curve, the fall in the real wage reduces labor supplied (and therefore output), so periods of higher wage inflation are associated with lower economic activity.[1]

This structure—monopsonistic wage setting combined with workers remaining on their intratemporal condition—is common across the modern monopsony-in-macro literature. For example, in Bredemeier et al. (2025), households choose hours and satisfy an intratemporal condition $w_t = -u_{n,t}/u_{c,t}$, while firms face firm-level labor supply and set wage markdowns accordingly. In Bardóczy et al. (2025), oligopsonistic firms choose wages given a residual labor-supply system; the paper explicitly highlights that because households remain on their labor-supply curve, partial pass-through to wages leads to a smaller employment response. Alpanda and Zubairy (2021) likewise shifts labor market power to the firm side via firm-specific labor supply and wage markdowns, but the labor-versus-leisure choice still pins down an intratemporal tradeoff for the household.

The demand-determined model by Broer et al. (2020) — Seen through this lens, it is immediate why Dennery-type monopsony models are subject to the critique in Broer et al. (2020). Broer et al. (2020) point out that in HANK models, because profits and capital income are concentrated, it is difficult to generate any response of hours worked and output to monetary shocks if workers are on their labor-supply curve. Therefore, HANK models that feature sticky prices but fully flexible labor markets will struggle to match the data.

To see this, consider their worker-capitalist setting, with worker consumption equal to labor income. If workers are on their labor-supply curve, we have

$$\Omega_t = -\frac{U_N(C_t, N_t)}{U_C(C_t, N_t)}, \qquad \text{(Labor supply)}$$

$$C_t = \Omega_t N_t, \qquad \text{(Hand to mouth)}$$

where C_t is consumption, N_t is hours worked, and Ω_t is the real wage. In addition, with balanced-growth preferences (King et al., 1988), $U(C, N) = \frac{C^{1-\sigma_c}}{1-\sigma_c} v(N)$ (where σ_c is the curvature parameter),

[1] In Appendix A, we present the model of Dennery (2020) and show that it is isomorphic to the standard three-equation New Keynesian model, but with the roles of leisure and consumption interchanged. An expansionary monetary policy shock thus leads to an expansion in leisure instead of consumption.

we have

$$-\frac{U_N(C_t,N_t)}{U_C(C_t,N_t)} = -\frac{C_t}{1-\sigma_c}\frac{v'(N_t)}{v(N_t)}. \tag{KPR}$$

These three equations together yield

$$1 = -\frac{1}{1-\sigma_c}\frac{N_t v'(N_t)}{v(N_t)},$$

i.e., hours worked are constant. In particular, changes in the real wage have no effect on hours worked because the income and substitution effects of a wage change exactly offset.

Note the generality of this result: if (i) workers have King-Plosser-Rebelo preferences (i.e., preferences consistent with balanced growth), (ii) workers earn only labor income, and (iii) the worker's intratemporal labor-supply condition holds, then hours worked are constant. In particular, this result also obtains under monopsony. Broer et al. (2020) show that the problem of constant hours worked can be solved by assuming rigid wages as in EHL, and interpret this as evidence in favor of wage rigidity. However, what restores procyclical hours is not wage rigidity per se, but that EHL-style wage setting breaks the requirement that workers satisfy their intratemporal labor-supply condition each period. By contrast, a monopsonistic wage-setting model such as Dennery (2020), despite featuring "rigid wages," does not generate fluctuations in hours worked if workers are hand-to-mouth, since they remain on their labor-supply curve.

The trilemma by Auclert et al. (2023) — The same observation explains why these models do not directly address the Auclert et al. (2023) trilemma. The argument of Auclert et al. (2023) consists of two propositions corroborated with numerical evidence.

Proposition 1 of Auclert et al. (2023) shows that the marginal propensity to earn and the marginal propensity to consume, at the individual level, in a broad class of incomplete-market models with flexible labor supply, is given by

$$\frac{\text{MPE}}{\text{MPC}} = \frac{W_t N_t}{C_t}\cdot\frac{\text{Frisch}}{\text{EIS}}\cdot(1-\text{CI}), \tag{ABR 1}$$

where MPE is the marginal propensity to earn, MPC is the marginal propensity to consume, $\frac{W_t N_t}{C_t}$ is the earned-income-to-consumption ratio, Frisch is the Frisch elasticity parameter, EIS is the elasticity of intertemporal substitution, and CI is a complementarity index capturing the strength of complementarity between consumption and labor. That is, the marginal propensity to earn and the marginal propensity to consume—which capture the two adjustment margins of the individual—are tightly linked.

Proposition 2 shows that, under the benchmark of a constant real interest rate, the fiscal multiplier of a government spending shock in a representative-agent environment with flexible labor supply is given by

$$\frac{dY_t}{dG_s} = \frac{1}{1-(1-\tau)\text{CI}} \cdot \mathbf{1}_{s=t} \tag{ABR 2}$$

where τ is a labor wedge, capturing monopoly power of intermediate goods producers and a labor tax.

The empirical evidence suggests that the average marginal propensity to consume is fairly high (e.g., MPC = 0.5 annually) while the average marginal propensity to earn is small (e.g., MPE = 0.04). Meanwhile, estimates of the fiscal multiplier are centered near 1 and typically below 2. With reasonable values of the Frisch elasticity and the elasticity of intertemporal substitution (Frisch = 0.5 and EIS = 0.5), the only way to obtain $\frac{\text{MPE}}{\text{MPC}} = \frac{0.04}{0.5}$ is through a high degree of complementarity, CI close to 1. But this implies a fiscal multiplier of approximately $\frac{dY_t}{dG_s} \approx \frac{1}{\tau} \cdot \mathbf{1}_{s=t}$ which, for moderate labor wedges τ (say $\tau = 0.3$), implies implausibly large multipliers, $\frac{dY_t}{dG_t} \approx 3$.

In the paper, there is a gap between Proposition 1 (which describes heterogeneous-agent environments) and Proposition 2 (which describes representative-agent environments). This gap is bridged by a numerical investigation in a HANK model. For our purposes, it is important to note that both Proposition 1 and Proposition 2 hold, verbatim, under monopsony power and flexible labor supply. As argued in Auclert et al. (2023), rigid wages à la EHL provide a solution to the trilemma, but only insofar as they break the intratemporal labor-supply condition.

Karabarbounis (2014) — A more direct argument in favor of business-cycle models with workers off their labor supply curve comes from the business-cycle accounting literature. The so-called *labor wedge* measures the gap between the marginal rate of substitution, $\text{MRS} = -U_N/U_C$, and the marginal rate of transformation, $\text{MRT} = F_N$. In a representative-agent setting, optimality requires MRS = MRT, and we can (in an accounting sense) attribute any deviation from equality to a labor wedge, $\text{MRS} = (1-\tau)\text{MRT}$. Chari et al. (2007) show that cyclical movements in the labor wedge are a quantitatively important feature of the business cycle.

Karabarbounis (2014) decomposes the labor wedge into the household labor supply wedge,

$$\text{MRS}_t = (1-\tau_{hh,t})W_t$$

and a firm labor demand wedge,

$$W_t = (1-\tau_{f,t})\text{MRT}_t.$$

His main result is that movements in the labor wedge are almost entirely accounted for by movements in the labor-supply wedge. That is, we can only rationalize a model with monopsony power and flexible labor supply if we impose large shocks to the labor supply condition. A parsimonious resolution is instead that workers are simply not on their labor-supply curve.

This motivates the modeling choice in the next section. We seek a model that is simultaneously consistent with firm market power and demand-determined hours. Bredemeier et al. (2025); Bardóczy et al. (2025); Dennery (2020) and Alpanda and Zubairy (2021) provide the former but not the latter. The canonical EHL model provides the latter but not the former. We present a wage contract model that achieves both.

3 A monopsony business cycle model with workers off their labor supply curve

The model combines a monopsonistic labor market, as in Card et al. (2018), with the wage-contract rigidity in Broer et al. (2023).

Workers have idiosyncratic tastes across firms, giving rise to monopsony power in the labor market. Each period, a fraction of workers are exogenously separated from their firm. Separated workers choose which new firm to work for as a function of the wage contracts offered by firms and their idiosyncratic tastes. Firms post nominally rigid wage contracts, which map hours worked into nominal wage payments. Once a match is formed, the firm unilaterally chooses hours worked. In anticipation of firms' "right to manage," equilibrium contracts are convex, reflecting the disutility of work for workers. The contracts are such that in steady state, firms fully internalize workers' marginal utility cost of working an additional hour and implement the first best.

3.1 Setting

Time is infinite and discrete, $t = 0, 1, 2 \ldots$. The economy consists of a unit-mass continuum of workers indexed by $i \in [0, 1]$ and a continuum of firms indexed by $j \in [0, 1]$. Workers belong to a representative household that enables full consumption insurance. We consider a closed economy without capital, so aggregate consumption equals aggregate output, $C_t = Y_t$.

Aggregate states. The aggregate states are the price level P_t, aggregate productivity A_t, and aggregate output Y_t. Throughout this note we study a *perfect-foresight path*: at each date t, agents know the entire future paths $\{P_{t+k}, A_{t+k}, Y_{t+k}\}_{k\geq 0}$. Due to certainty equivalence, as emphasized by Boppart et al. (2018) and Auclert et al. (2021), the perfect-foresight path is a sufficient statistic for simulating a model with stochastic fluctuations up to a first order approximation.

Idiosyncratic productivity. Each firm is hit by an idiosyncratic productivity shock $A_{j,t}$ (i.i.d. across j and t). Crucially, $A_{j,t}$ is realized *after* matches are formed in period t (and before hours are chosen), so contracts cannot condition on $A_{j,t}$.

Labor-market timing, contracts, and matching. Each period proceeds as follows:

1. At the start of period t, each worker is separated from their incumbent employer with probability $1 - \theta$. Separated workers draw a vector of idiosyncratic taste shocks $\{\varepsilon_{ij,t}\}_{j\in[0,1]}$ for

working at different firms (Type I Extreme Value). The realized $\varepsilon_{ij,t}$ associated with the chosen employer remains fixed for the duration of the match (until the next separation event).

2. Firms post nominal wage contracts. A contract is a schedule $W_{j,t}(\cdot)$ mapping hours into nominal total payments and is taken as given by the firm ex post. Contracts are *Calvo-style vintage contracts*: a worker hired at t is assigned a vintage-t contract, and that contract remains in force (without renegotiation) until the worker separates. After entering the contract, the firm has the right to manage hours ex post.

3. Separated workers choose which firm to work for, generating a new hire measure $L_{j,t}$ at each firm.

4. The idiosyncratic shock $A_{j,t}$ is realized. Given $W_{j,t}(\cdot)$ and $(A_t, P_t, A_{j,t})$, the firm chooses hours for its employed workers.

Production. Production is linear in hours. Firm j employs $\theta^s L_{j,t-s}$ workers who were hired s periods ago. With aggregate productivity A_t and idiosyncratic productivity $A_{j,t}$, firm j produces

$$Y_{j,t} = A_t A_{j,t} \sum_{s=0}^{\infty} \theta^s L_{j,t-s}\, N_{j,t|t-s},$$

where $N_{j,t|t-s}$ denotes hours in period t per worker employed at firm j under a contract of vintage $t-s$. Linearity implies that we can write the firm's ex-post problem "per match" without loss of generality: the hours choice is separable across workers, so the firm assigns the same hours $N_{j,t|t-s}$ to all workers within a given contract vintage, while aggregation keeps track of cohort sizes $L_{j,t-s}$.

3.2 Model details

Preferences. Workers belong to a representative household with complete insurance. The household has preferences

$$\sum_{t=0}^{\infty} \beta^t \left[\log C_t - \int_0^1 v(N_{i,t})\, di + \int_0^1 \varepsilon_{ij(i),t}\, di \right],$$

where $N_{i,t}$ is hours worked by worker i, and $\varepsilon_{ij(i),t}$ is a match-specific taste shifter. Following the timing in Subsection 3.1, the taste shock is drawn upon separation and remains fixed within the match until the next separation event. When we log-linearize the model in Subsection 3.3, disutility is given by the standard MacCurdy functional form $v(N) = \kappa N^{1+\psi}/(1+\psi)$.

Let $\lambda_t \equiv 1/C_t$ denote the household's marginal utility of consumption. The household's consumption-saving decision is characterized by the Euler equation

$$\lambda_t = \beta R_t \lambda_{t+1}. \tag{1}$$

General equilibrium, monetary policy, and productivity. Aggregate consumption equals aggregate output,

$$C_t = Y_t, \tag{2}$$

and the gross real interest rate is given by

$$R_t = \frac{1 + i_t}{\Pi_{t+1}}. \tag{3}$$

For parsimony, monetary policy is set with a real rate rule,

$$1 + i_t = \frac{\Pi_{t+1}}{\beta} \exp(\epsilon_t^{mp}) \tag{4}$$

where

$$\epsilon_t^{mp} = \rho_{mp} \epsilon_{t-1}^{mp} \qquad t \geq 1 \tag{5}$$

and ϵ_0^{mp} is exogenously given. Productivity is given by

$$\log A_t = \rho_a \log A_{t-1} \qquad t \geq 1 \tag{6}$$

with A_0 exogenously given.

Firms and production. Recall that firm j draws idiosyncratic productivity $A_{j,t}$ each period (i.i.d. across j and t), realized after matching, and output is linear in hours.

Firms choose how many hours to demand from their workers, given each worker's wage contract. Denote hours in period t for the cohort of workers entering into a contract with firm j at time τ by $N_{j,t|\tau}$. Given $(A_t, P_t, A_{j,t})$ and the vintage-τ wage schedule $W_{j,\tau}(\cdot)$, the firm chooses hours for the vintage-τ cohort, $N_{j,t|\tau}$, to maximize per-worker profits,

$$\max_{N_{j,t|\tau}} P_t A_t A_{j,t} N_{j,t|\tau} - W_{j,\tau}\left(N_{j,t|\tau}\right),$$

implying the (per-worker) labor-demand condition

$$P_t A_t A_{j,t} = W'_{j,\tau}\left(N_{j,t|\tau}\right). \tag{7}$$

Worker choice and new hires. At the start of period t, separated workers draw $\{\varepsilon_{ij,t}\}_{j\in[0,1]}$ i.i.d. Type I Extreme Value with dispersion $\sigma(1 - \beta\theta)$, choose a firm, and keep the associated taste shock fixed for the duration of the match. Let $\widetilde{V}_{ij,t}$ denote the value (in utility units) for the representative household of having worker i choosing firm j at time t. Given a vintage-t contract at firm j, hours in future periods are determined by Equation (7) and we can write

$$\begin{aligned}\tilde{V}_{ij,t} &\equiv \sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}\frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}} - v(N_{j,t+s|t}) + \varepsilon_{ij,t}\right]\\ &= V_{j,t} + \frac{\varepsilon_{ij,t}}{1-\beta\theta},\end{aligned}$$

where $V_{j,t}$ collects the part of match utility that does not depend on $\varepsilon_{ij,t}$,

$$V_{j,t} = \sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}\frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}} - v(N_{j,t+s|t})\right]. \tag{8}$$

The logit structure implied by the Type I Extreme Value shocks implies that the measure of new hires at firm j is

$$L_{j,t} = (1-\theta)\frac{\exp(V_{j,t}/\sigma)}{\int_0^1 \exp(V_{k,t}/\sigma)\,dk}. \tag{9}$$

The contract-posting problem (vintage t): setup. Firm j chooses to post the vintage-t wage schedule $W_{j,t}(\cdot)$ to maximize the expected present value of profits from the cohort it hires at time t, discounted in utility units by $\beta^s\lambda_{t+s}$ and accounting for separation with probability θ^s:

$$\max_{W_{j,t}(\cdot),\,V_{j,t},\,L_{j,t},\,\{N_{j,t+s|t}\}_{s\geq 0}} \sum_{s=0}^{\infty}(\beta\theta)^s\lambda_{t+s}\,L_{j,t}\left[A_{t+s}A_{j,t+s}N_{j,t+s|t} - \frac{W_{j,t}(N_{j,t+s|t})}{P_{t+s}}\right] \tag{10}$$

subject to the worker value definition, Equation (8), worker choice, Equation (9), and ex-post firm optimality for each future date $t+s$,

$$P_{t+s}A_{t+s}A_{j,t+s} = W'_{j,t}(N_{j,t+s|t}). \tag{11}$$

Define the (labor-disutility adjusted) value added of a vintage-t match at firm j as

$$S_{j,t} \equiv \sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t} - v(N_{j,t+s|t})\right]. \tag{12}$$

Substituting Equation (8) into the objective and rewriting in terms of value added $S_{j,t}$, we can rewrite the firm's problem as

$$\max_{W_{j,t}(\cdot),L_{j,t},\{N_{j,t+s|t}\}_{s\geq 0},S_{j,t}} L_{j,t}(S_{j,t}-V_{j,t}) \qquad \text{s.t.}$$

$$L_{j,t} = (1-\theta)\frac{\exp(V_{j,t}/\sigma)}{\int_0^1 \exp(V_{k,t}/\sigma)\,dk},$$

$$S_{j,t} = \sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t} - v(N_{j,t+s|t})\right],$$

$$W'_{j,t}(N_{j,t+s|t}) = P_{t+s}A_{t+s}A_{j,t+s}.$$

Level of worker compensation. Taking the first-order conditions with respect to $L_{j,t}$ and $V_{j,t}$ yields that the firm receives a constant amount σ of value added per worker, and the worker receives

$$V_{j,t} = S_{j,t} - \sigma. \tag{13}$$

Allocative constrained efficiency and the marginal wage schedule. Taking the first-order conditions with respect to $S_{j,t}$ and $\{N_{j,t+s|t}\}_{s\geq 0}$ yields that the optimal wage contract satisfies

$$\max_{W_{j,t}(\cdot),\{N_{j,t+s|t}\}_{s\geq 0}} \sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t} - v(N_{j,t+s|t})\right] \quad \text{s.t.} \quad W'_{j,t}(N_{j,t+s|t}) = P_{t+s}A_{t+s}A_{j,t+s}.$$

This is exactly the contracting problem analyzed in Broer et al. (2023) (their Equation (12)). We solve for a first-order approximation of this problem in the log-linearized equilibrium below.

Symmetric partial equilibrium. Since all firms are ex ante identical, $S_{j,t} = S_t$ and $W_{j,t} = W_t$ are equal across firms. As a consequence, $V_{j,t} = V_t$ and $L_{j,t} = (1-\theta)$ are also equal across firms.

3.3 Log-linearized equilibrium

Steady state and notation. We log-linearize around a deterministic steady state with constant aggregate productivity $\bar{A}$, price level $\bar{P}$, and marginal utility $\bar{\lambda}$. For any aggregate variable X_t, define its log deviation $\hat{x}_t \equiv \log(X_t/\bar{X})$. Let goods-price inflation be $\pi_t \equiv \log(P_t/P_{t-1})$.

A first-order approximation to the optimal contract $W_t(\cdot)$. The optimal contract maximizes the contracting problem

$$\max_{W_t(\cdot),\{N_{j,t+s|t}\}_{s\geq 0}} \sum_{s=0}^{\infty}(\beta\theta)^s\left[\lambda_{t+s}A_{t+s}A_{j,t+s}N_{j,t+s|t} - v(N_{j,t+s|t})\right] \quad \text{s.t.} \quad P_{t+s}A_{t+s}A_{j,t+s} = W'_t(N_{j,t+s|t}).$$

Absent the constraint, the first best implements $\lambda_{t+s}A_{t+s}A_{j,t+s} = v'(N_{j,t+s|t})$. In a steady state with constant aggregates $(\bar{P},\bar{A},\bar{\lambda})$, this is implemented by setting $W'(N) = \frac{\bar{P}}{\bar{\lambda}}v'(N)$, i.e., real marginal pay equals the marginal disutility of work. This wage contract makes the firm internalize the worker's disutility cost when assigning hours.

The first-order perturbation of this problem, with respect to aggregate shocks, is characterized in Broer et al. (2023) (see Equation (12)). It results in an optimal marginal wage schedule given by

$$W_t'(N) = (1 + \hat{\xi}_t)\frac{\bar{P}}{\bar{\lambda}}v'(N)$$

where the contract "slope" is given by,

$$\hat{\xi}_t = (1 - \beta\theta)\left[\sum_{s=0}^{\infty}(\beta\theta)^s(\hat{p}_{t+s} - \hat{\lambda}_{t+s})\right],$$

i.e., the average price of consumption utility for the duration of the contract. Away from the steady state, the optimal contract can no longer implement the first best pointwise. Instead, the best it can do is to target the first-best optimality condition *on average* over the expected contract duration.

Within-vintage labor demand. To obtain a closed-form log-linear relationship, assume standard constant Frisch elasticity disutility, $v(N) = \kappa\frac{N^{1+\psi}}{1+\psi}$ (so $v'(N) \propto N^{\psi}$). For a cohort of workers with contract vintage $t - s$, hours in period t satisfy the log-linear condition

$$\hat{a}_t + \hat{p}_t = \hat{\xi}_{t-s} + \psi\,\hat{n}_{t\,|\,t-s}, \tag{14}$$

where $\hat{n}_{t\,|\,t-s}$ is hours chosen ex post under a vintage-$(t-s)$ contract and $\hat{a}_t$ is the aggregate productivity shock.

Aggregation across vintages. At time t, a share $(1-\theta)\theta^s$ of workers/firms are in vintage $t-s$. Define the *allocative nominal wage* as the cross-vintage average of contract "slopes":

$$\hat{w}_t^{all} \equiv (1-\theta)\sum_{s=0}^{\infty}\theta^s\hat{\xi}_{t-s}, \qquad \hat{\omega}_t^{all} \equiv \hat{w}_t^{all} - \hat{p}_t. \tag{15}$$

Aggregating Equation (14) across vintages yields

$$\hat{a}_t + \hat{p}_t = \hat{w}_t^{all} + \psi\,\hat{n}_t, \qquad \text{equivalently} \qquad \hat{a}_t = \hat{\omega}_t^{all} + \psi\,\hat{n}_t. \tag{16}$$

Wage Phillips curve and accounting identity. Let *allocative-wage inflation* be $\pi_t^{all} \equiv \hat{w}_t^{all} - \hat{w}_{t-1}^{all}$. As in Broer et al. (2023), the Calvo structure implies a forward-looking Phillips curve in allocative wages:

$$\pi_t^{all} = \beta\pi_{t+1}^{all} - \gamma\left(\hat{\omega}_t^{all} + \hat{\lambda}_t\right), \qquad \gamma \equiv \frac{(1-\theta)(1-\beta\theta)}{\theta}. \tag{17}$$

Combining (17) with (16) gives an equivalent representation that makes the "wage gap" explicit:

$$\pi_t^{all} = \beta \pi_{t+1}^{all} - \gamma \left(\hat{a}_t + \hat{\lambda}_t - \psi \, \hat{n}_t \right). \tag{18}$$

Finally, the allocative real wage evolves according to the accounting identity

$$\hat{\omega}_t^{all} = \hat{\omega}_{t-1}^{all} + \pi_t^{all} - \pi_t. \tag{19}$$

4 General equilibrium dynamics

The model can be collapsed into six equations in six endogenous variables. Using $\hat{\lambda}_t = -\hat{c}_t = -\hat{y}_t$, we obtain the allocative wage dynamics:

$$\pi_t^{all} = \beta \pi_{t+1}^{all} - \gamma \left(\hat{\omega}_t^{all} - \hat{y}_t \right), \tag{20}$$

$$\hat{\omega}_t^{all} = \hat{\omega}_{t-1}^{all} + \pi_t^{all} - \pi_t. \tag{21}$$

Labor demand is given by

$$\hat{a}_t = \hat{\omega}_t^{all} + \psi \, \hat{n}_t, \tag{22}$$

and aggregate output is given by

$$\hat{y}_t = \hat{a}_t + \hat{n}_t. \tag{23}$$

The household's Euler equation, together with market clearing, yields a standard dynamic IS curve,

$$\hat{y}_t = \hat{y}_{t+1} - (i_t - \pi_{t+1} - \rho). \tag{24}$$

The monetary policy rule yields

$$i_t = \rho + \pi_{t+1} + \epsilon_t^{mp}. \tag{25}$$

Equations (20)–(25) in the three price variables $\pi_t^{all}, \hat{\omega}_t^{all}, \pi_t$, output and hours worked $\hat{y}_t, \hat{n}_t$, and the nominal interest rate i_t, together with the exogenous processes for a_t and ϵ_t^{mp}, form a closed system. We can determine hours worked and output without knowing the degree of monopsony power (as captured by the parameter σ). This yields a sharp irrelevance result.

Proposition 1 (Irrelevance of monopsony for allocative equilibrium dynamics)**.** *Fix the exogenous processes* $\{\hat{a}_t, \epsilon_t^{mp}\}_{t \geq 0}$ *and policy parameters. Consider an equilibrium path for* $(\pi_t^{all}, \hat{\omega}_t^{all}, \pi_t, \hat{y}_t, \hat{n}_t, i_t)$ *satisfying Equations* (20)–(25)*. Then the equilibrium dynamics of these variables are independent of the monopsony parameter* σ*.*

Parameter	Value
β	0.99
θ	0.75
ψ	1
ϕ_π	1.5
ρ_a	0.9
ρ_ϵ	0.5
μ	0.4

Table 1: Parameter values used in the quantitative experiments.

Proof. The closed system (20)–(25) contains no occurrence of σ. Therefore, any equilibrium (and, under standard determinacy conditions, the unique equilibrium) for $(\pi_t^{all}, \hat{\omega}_t^{all}, \pi_t, \hat{y}_t, \hat{n}_t, i_t)$ is invariant to σ. □

Monopsony does, however, matter for the dynamics of labor compensation through its effect on the markdown. Expected profits per match equal $(1-\beta\theta)\sigma/\lambda$; thus the profit share (markdown wedge) is $\frac{(1-\beta\theta)\sigma}{\lambda Y}$ (see Appendix Section C for details). Let μ denote the steady-state markdown. The next proposition shows how to compute real total labor compensation.

Proposition 2 (Computing measured compensation)**.** *Let $\hat{\omega}_t^{tot}$ denote the log deviation of real total labor compensation per worker, decomposed into cumulative real base pay $\hat{\omega}_t^{0,cum}$ and real variable pay $\hat{\omega}_t^{var}$. Define the reduced-form coefficients*

$$\kappa_a \equiv \frac{(1+\psi)/\psi}{1-\mu\,(1+\psi)/\psi}, \qquad \kappa_\lambda \equiv \kappa_a - 1. \tag{26}$$

Measured total compensation can be computed from the allocative equilibrium using the following objects:

$$\hat{\omega}_t^{tot} = \left(1 - \frac{1}{(1+\psi)\,(1-\mu)}\right)\hat{\omega}_t^{0,cum} + \frac{1}{(1+\psi)\,(1-\mu)}\hat{\omega}_t^{var}, \tag{27}$$

$$\hat{\omega}_t^{0,cum} = \frac{\theta}{1+\beta\theta^2}\hat{\omega}_{t-1}^{0,cum} + \frac{\beta\theta}{1+\beta\theta^2}\hat{\omega}_{t+1}^{0,cum} + \frac{1-\theta}{1+\beta\theta^2}\left[(1-\beta\theta)\left(\kappa_\lambda\hat{\lambda}_t + \kappa_a\hat{a}_t\right) + \beta\theta\,\pi_{t+1}\right], \tag{28}$$

$$\hat{\omega}_t^{var} = \frac{1+\psi}{\psi}\hat{a}_t - \frac{1}{\psi}\hat{\omega}_t^{all}. \tag{29}$$

Proof. See Appendix C. □

4.1 Illustrative quantitative experiments

We compute the impulse responses of output and prices to a productivity shock in Figure 1 and to a monetary policy shock in Figure 2, with parameter values given in Table 1.

The model delivers textbook responses of inflation and output: a positive productivity shock generates a negative output gap along with a fall in the price level, and a contractionary monetary policy shock reduces output and the price level.

4.2 Comparison models

As shown in Proposition 1, the dynamics of output are insensitive to monopsony power in our model. To highlight how the response of the price level depends on how monopsony is modeled, we compare our model with the standard New Keynesian wage-setting friction as in Erceg et al. (2000) and with the inverted monopsony model exemplified by Dennery (2020). The key distinction is whether firms have the right to manage hours (as in our model) or whether workers choose hours along an intratemporal labor-supply condition.

Our model, described by Equations (20)-(25), can be reduced to the following three equations (Appendix B provides the derivation),

$$\pi_t^{all} = \beta\pi_{t+1}^{all} + \gamma(1+\psi)(\hat{y}_t - \hat{a}_t), \tag{NKWPC}$$

$$\pi_t = \pi_t^{all} + \psi\Delta\hat{y}_t - (1+\psi)\Delta\hat{a}_t, \tag{wage accounting}$$

$$\hat{y}_t = \hat{y}_{t+1} - (i_t - \pi_{t+1} - \rho), \tag{Euler equation}$$

together with monetary policy,

$$i_t = \rho + \pi_{t+1} + \epsilon_t^{mp}.$$

Analogously, a corresponding model with Erceg et al. (2000) wage-setting frictions, flexible prices and a representative household is described by

$$\pi_t^w = \beta\pi_{t+1}^w + \gamma^{EHL}(1+\psi)(\hat{y}_t - \hat{a}_t), \tag{NKWPC}$$

$$\pi_t = \pi_t^w - \Delta\hat{a}_t, \tag{wage accounting}$$

$$\hat{y}_t = \hat{y}_{t+1} - (i_t - \pi_{t+1} - \rho), \tag{Euler equation}$$

and monetary policy. The two models are isomorphic under $\psi = 0$.

Finally, the monopsony model with Dennery (2020) wage-setting frictions is summarized by

$$\pi_t^w = \beta\pi_{t+1}^w - \gamma^D(1+\psi)(\hat{y}_t - \hat{a}_t), \tag{NKWPC}$$

$$\pi_t = \pi_t^w + \psi\Delta\hat{a}_t - (1+\psi)\Delta\hat{y}_t, \tag{wage accounting}$$

$$\hat{y}_t = \hat{y}_{t+1} - (i_t - \pi_{t+1} - \rho). \tag{Euler equation}$$

We explicitly compare these models in the following proposition.

Proposition 3 (Cumulative inflation under a real rate rule)**.** *Consider the three models above—our model, EHL, and Dennery (2020)—with the real rate monetary policy rule $i_t = \pi_{t+1} + \epsilon_t$. In all three models, cumulative price inflation equals cumulative wage inflation, $\sum_{t=0}^{\infty}\pi_t = \sum_{t=0}^{\infty}\pi_t^w$ (where π_t^w denotes π_t^{all} in our model). Cumulative inflation is given by:*

(i) ***Monetary policy shock*** *($\epsilon_t = \rho_{mp}^t \epsilon_0$, $|\rho_{mp}| < 1$, $\hat{a}_t = 0$). In the EHL model and our model,*

$$\sum_{t=0}^{\infty} \pi_t = -\frac{\tilde{\gamma}(1+\psi)\,\epsilon_0}{(1-\rho_{mp})^2(1-\beta\rho_{mp})},$$

where $\tilde{\gamma} = \gamma^{EHL}$ or γ respectively. In the Dennery (2020) model,

$$\sum_{t=0}^{\infty} \pi_t = +\frac{\gamma^D(1+\psi)\,\epsilon_0}{(1-\rho_{mp})^2(1-\beta\rho_{mp})}.$$

(ii) ***Productivity shock*** *($\hat{a}_t = \rho_a^t \hat{a}_0$, $|\rho_a| < 1$, $\epsilon_t = 0$). In the EHL model and our model,*

$$\sum_{t=0}^{\infty} \pi_t = -\frac{\tilde{\gamma}(1+\psi)\,\hat{a}_0}{(1-\rho_a)(1-\beta\rho_a)},$$

and in the Dennery (2020) model,

$$\sum_{t=0}^{\infty} \pi_t = +\frac{\gamma^D(1+\psi)\,\hat{a}_0}{(1-\rho_a)(1-\beta\rho_a)}.$$

In both cases, a contractionary monetary shock ($\epsilon_0 > 0$) or a positive productivity shock ($\hat{a}_0 > 0$) generates cumulative deflation in the EHL and our model, but cumulative inflation *in the Dennery (2020) model.*

Proof. See Appendix D. □

With a real rate rule, a contractionary monetary policy shock reduces output, and a positive productivity shock opens a negative output gap (output is pinned down while potential output rises). In both cases, EHL and our model generate cumulative deflation—the standard New Keynesian channel. The Dennery (2020) model produces the opposite sign due to its inverted Phillips curve. The impulse responses are shown in Figures 1 and 2.

Figure 1: IRFs to a productivity shock.

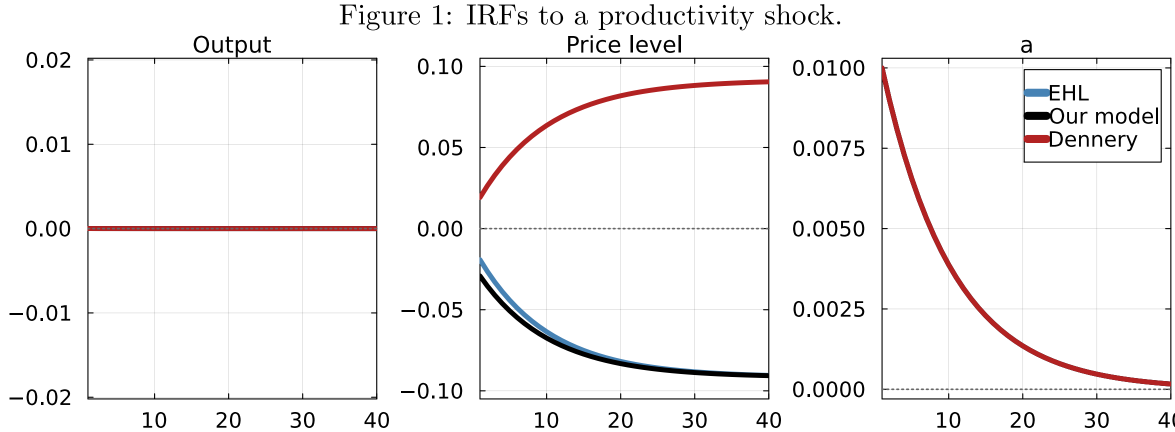
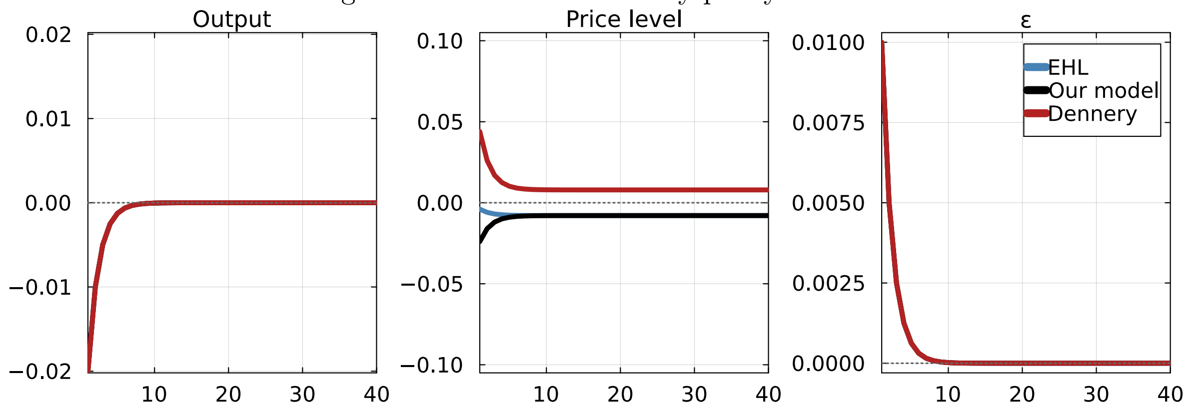


Figure 2: IRFs to a monetary policy shock.



4.3 Measured real wage dynamics and monopsony power

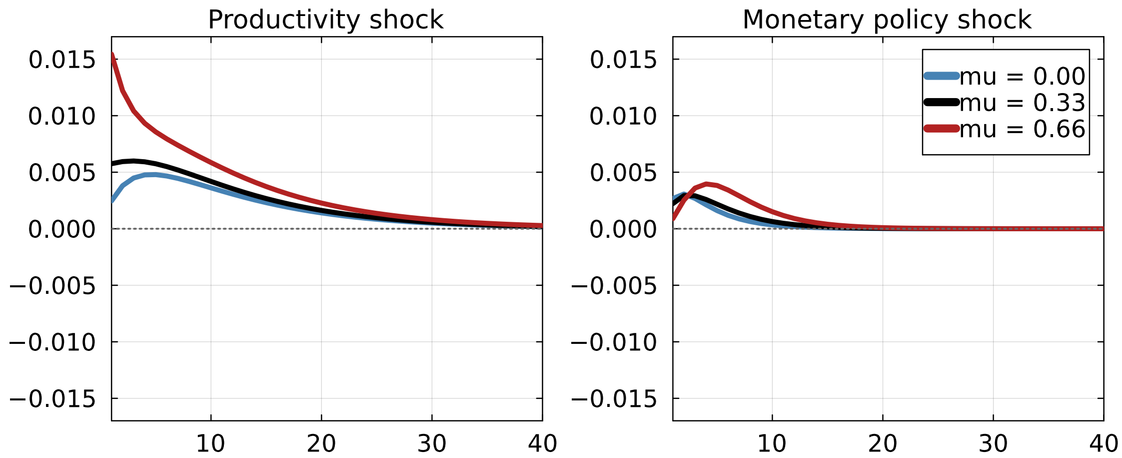
We now connect the model to a common empirical measure of the real wage: *total wage compensation divided by hours worked*. In log deviations, our *measured* real wage is therefore

$$\hat{\omega}_t^{meas} \equiv \hat{\omega}_t^{tot} - \hat{n}_t,$$

where $\hat{\omega}_t^{tot}$ is total real labor compensation (wage bill) and $\hat{n}_t$ is hours worked. In our contracting environment, $\hat{\omega}_t^{meas}$ depends on the degree of monopsony through the steady-state markdown μ, because the markdown changes the weight of marginal (hours-contingent) pay versus the rigid contract installment in total compensation (see Proposition 2 in Section 4).

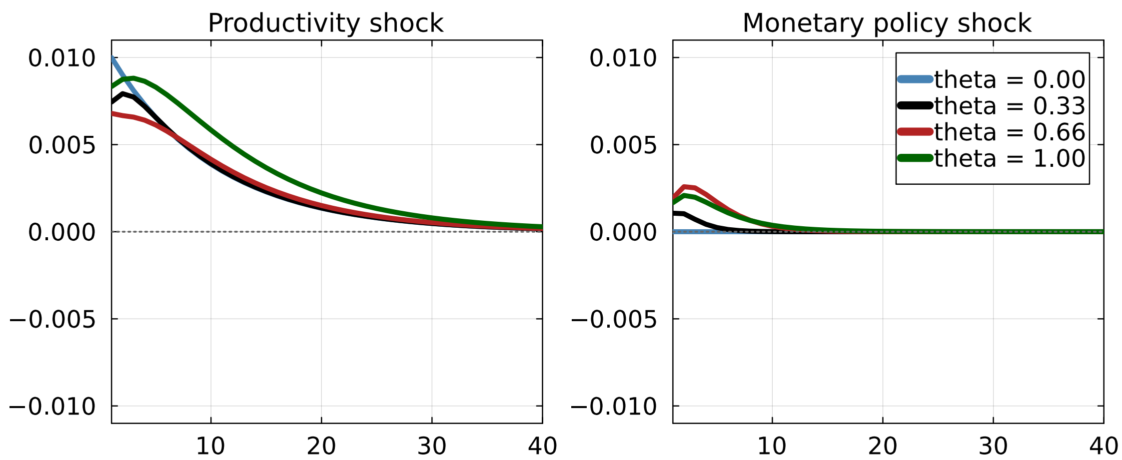
Figure 3 shows that increasing the markdown amplifies the response of the measured real wage to both productivity and monetary shocks, holding the baseline calibration fixed. Figure 4 shows that increasing wage rigidity (higher θ) strengthens these dynamics. Finally, Figure 5 combines both margins: for θ near zero (flexible wages) the measured real wage is nearly insensitive to the markdown, while with substantial wage rigidity the interaction between θ and the markdown becomes quantitatively important.

Figure 3: Effect of Monopsony for the Measured Real Wage



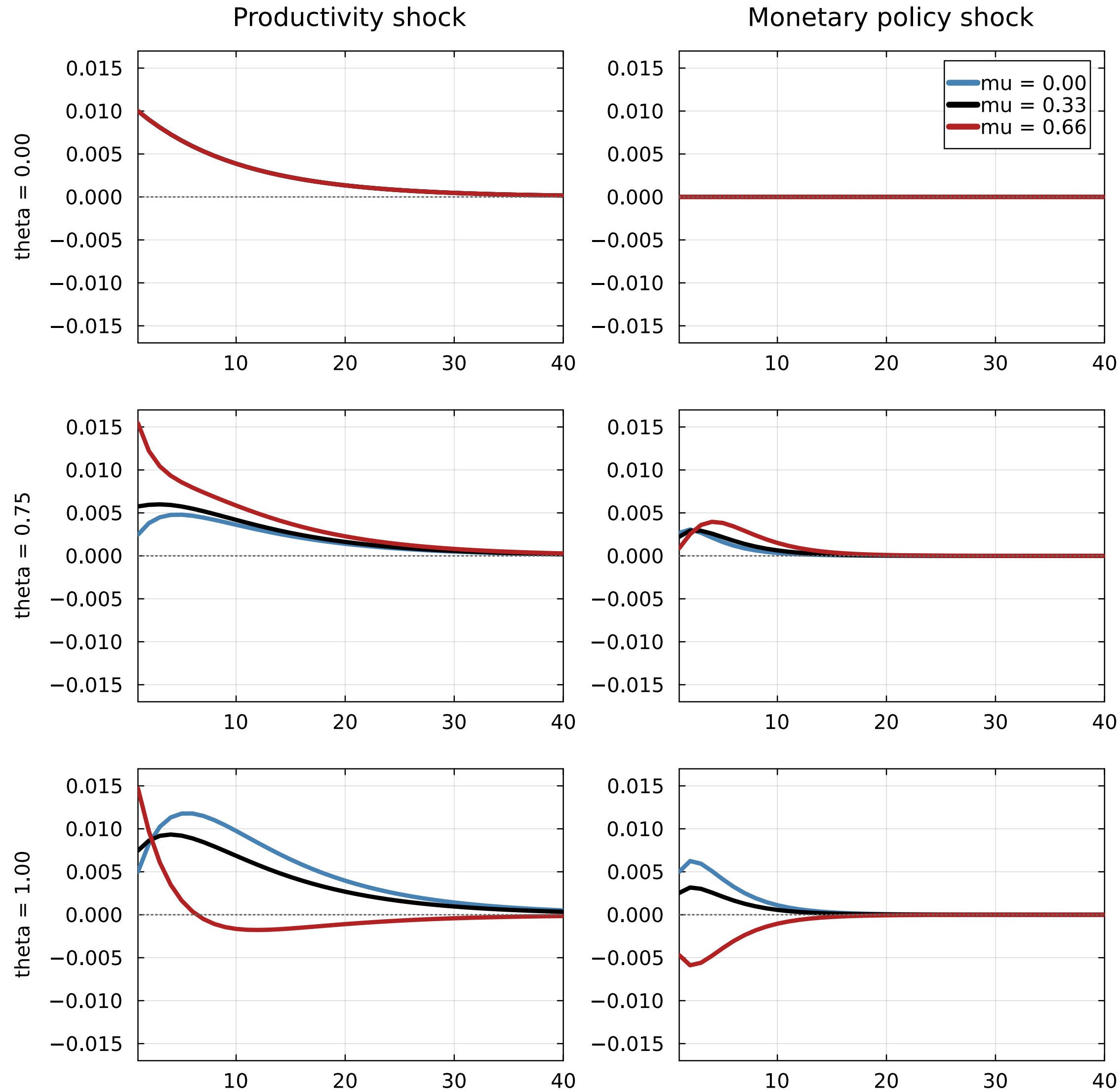
Notes: IRFs for different markdowns at the baseline calibration. Outcome variable measured real wage ($\hat{\omega}_t^{meas} = \hat{\omega}_t^{tot} - \hat{n}_t$).

Figure 4: Effect of Wage Rigidity for the Measured Real Wage



Notes: IRFs for different degrees of wage rigidity θ (holding markdown at the baseline). Outcome variable measured real wage ($\hat{\omega}_t^{meas} = \hat{\omega}_t^{tot} - \hat{n}_t$).

Figure 5: Interaction of Monopsony and Wage Rigidity for the Measured Real Wage



Notes: IRFs for the interaction of monopsony power and wage rigidity. Rows set $\theta \in \{0, \theta^{baseline}, 1\}$ and within each panel lines vary $\mu \in \{0, 0.33, 0.66\}$. Outcome variable measured real wage ($\hat{\omega}_t^{meas} = \hat{\omega}_t^{tot} - \hat{n}_t$).

5 Conclusions

The interaction between firm market power and labor market dynamics has attracted renewed interest. Recent approaches posit that firms derive power from workers' preference for employer variety, while hours worked are freely chosen by workers. Combined with rigid wage setting, this structure implies an inverted Phillips curve relative to Erceg et al. (2000), so that output rises following a monetary contraction.

We propose an alternative way to incorporate monopsony power into a New Keynesian model. Our model resolves these discrepancies within a contracting framework and delivers a monopsony model that is consistent with both wage rigidity and demand-determined hours. The model shows that monopsony is irrelevant for the dynamics of output and inflation but affects the dynamics of real wages.

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A The model of Dennery (2020)

The following equations summarize the model in Dennery (2020).

$$\pi_t^w = \beta \pi_{t+1}^w + \gamma \left(\hat{a}_t + \hat{\lambda}_t - \psi \hat{n}_t \right) \qquad \gamma \equiv \frac{(1-\theta)(1-\beta\theta)}{\theta} \tag{30}$$

$$\hat{\omega}_t = \hat{\omega}_{t-1} + \pi_t^w - \pi_t \tag{31}$$

$$\hat{y}_t = \hat{a}_t + \hat{n}_t \tag{32}$$

$$\psi \hat{n}_t = \hat{\lambda}_t + \hat{\omega}_t \tag{33}$$

$$\hat{y}_t = \hat{y}_{t+1} - \frac{1}{\delta}(i_t - \pi_{t+1}) \tag{34}$$

$$\hat{\lambda}_t = -\hat{y}_t \tag{35}$$

$$i_t = \phi_\pi \pi_t + \epsilon_t \tag{36}$$

Isomorphism Let $l_t \equiv -n_t$ be a measure of leisure. Absent productivity shocks and with linear production, equilibrium dynamics of Dennery (2020)'s monopsony model are determined by

$$l_t = l_{t+1} - \frac{1}{\psi}(i_t - \pi_{t+1}^w),$$
$$\pi_t^w = \beta \mathbb{E}_t \pi_{t+1}^w + \gamma(\delta + \psi) l_t.$$

Note that these equations in leisure l_t and inflation in the price of leisure, i.e., the wage, π_t^w are *exactly* the same as the two non-policy equations of the standard New Keynesian model, in output y_t and inflation in the price of the output good, π_t,

$$y_t = y_{t+1} - \frac{1}{\delta}(i_t - \pi_{t+1}),$$
$$\pi_t = \beta \pi_{t+1} + \gamma(\delta + \psi) y_t,$$

except that the curvature of utility with respect to consumption, δ, is replaced by the curvature of utility with respect to hours worked, ψ. Under Dennery (2020)'s monopsony model, a "contractionary" monetary policy shock leads to a contraction in *leisure*, i.e., an output boom.

B Summarizing our model

$$\pi_t^{all} = \beta\pi_{t+1}^{all} - \gamma\left(\hat{\omega}_t^{all} + \hat{\lambda}_t\right), \qquad \gamma \equiv \frac{(1-\theta)(1-\beta\theta)}{\theta} \tag{37}$$

$$\hat{\omega}_t^{all} = \hat{\omega}_{t-1}^{all} + \pi_t^{all} - \pi_t \tag{38}$$

$$\hat{y}_t = \hat{a}_t + \hat{n}_t \tag{39}$$

$$\hat{a}_t = \hat{\omega}_t^{all} + \psi\hat{n}_t \tag{40}$$

$$\hat{y}_t = \hat{y}_{t+1} - (i_t - \pi_{t+1} - \rho) \tag{41}$$

$$\hat{\lambda}_t = -\hat{y}_t \tag{42}$$

$$i_t = \rho + \pi_{t+1} + \epsilon_t \tag{43}$$

To summarize the seven equations in the three-equation form (NKWPC, wage accounting, Euler equation) we start by combining Equation (42) and Equation (37),

$$\pi_t^{all} = \beta\pi_{t+1}^{all} - \gamma(\hat{\omega}_t^{all} - \hat{y}_t). \tag{44}$$

Use Equation (39) and Equation (40) to express $\hat{\omega}_t^{all}$ in terms of $\hat{y}_t$ and $\hat{a}_t$,

$$\hat{\omega}_t^{all} = \hat{a}_t(1+\psi) - \psi\hat{y}_t.$$

This allows us to express $\hat{\omega}_t^{all} - \hat{y}_t$ in Equation (44) as

$$\hat{\omega}_t^{all} - \hat{y}_t = (1+\psi)(\hat{a}_t - \hat{y}_t), \tag{45}$$

obtaining the NKWPC:

$$\pi_t^{all} = \beta\pi_{t+1}^{all} + \gamma(1+\psi)(\hat{y}_t - \hat{a}_t). \tag{NKWPC}$$

Next, by first differencing Equation (45) we obtain

$$\Delta\hat{\omega}_t^{all} = (1+\psi)\Delta\hat{a}_t - \psi\Delta\hat{y}_t.$$

which, substituted into Equation (38), gives the wage accounting identity:

$$\pi_t = \pi_t^{all} + \psi\Delta\hat{y}_t - (1+\psi)\Delta\hat{a}_t. \tag{wage accounting}$$

Finally, Equation (41) is the Euler equation.

C Compensation derivations

This appendix derives the objects used to map the allocative equilibrium into measured labor compensation.

Log-linearizing Equation (12) We start by log-linearizing the match value added $S_{j,t}$ defined in Equation (12). Define the log deviation $\hat{S}_t \equiv \log(S_t/\bar{S})$, where $\bar{S}$ is the steady-state value along the zero-shock path and where (in partial equilibrium) $S_{j,t} = S_t$.

Differentiate (12) around steady state. Writing the per-period (utility-unit) value added term as

$$x_{t+s} \equiv \lambda_{t+s} A_{t+s} A_{j,t+s} N_{j,t+s|t} - v(N_{j,t+s|t}),$$

we have

$$dS_t = \sum_{s=0}^{\infty} (\beta\theta)^s \mathbb{E}_t \left[dx_{t+s} \right].$$

The total differential of x_{t+s} is

$$dx_{t+s} = A_{t+s} A_{j,t+s} N_{j,t+s|t} \, d\lambda_{t+s} + \lambda_{t+s} A_{j,t+s} N_{j,t+s|t} \, dA_{t+s} + \big(\lambda_{t+s} A_{t+s} A_{j,t+s} - v'(N_{j,t+s|t})\big) \, dN_{j,t+s|t}.$$

Under the optimal contract, the ex-post hours choice satisfies the efficient intratemporal condition in steady state, $v'(\bar{N}_{j,t+s|t}) = \bar{\lambda} \, \bar{A} \, A_{j,t+s}$, so the last term is second order and drops from the first-order approximation. Therefore,

$$dS_t = \sum_{s=0}^{\infty} (\beta\theta)^s \mathbb{E}_t \left[\bar{\lambda} \, \bar{A} \, A_{j,t+s} \bar{N}(A_{j,t+s}) \right] \left(\hat{\lambda}_{t+s} + \hat{a}_{t+s} \right), \tag{46}$$

where $\hat{\lambda}_t \equiv d\lambda_t/\bar{\lambda}$ and $\hat{a}_t \equiv dA_t/\bar{A}$ denote first-order (log) deviations, and $\bar{N}(A_j)$ is the steady-state hours rule as a function of idiosyncratic productivity.

To express this in log deviations of S_t, note that $\bar{S} = \sum_{s \geq 0} (\beta\theta)^s \bar{x} = \bar{x}/(1-\beta\theta)$, where

$$\bar{x} \equiv \mathbb{E}\big[\bar{\lambda} \, \bar{A} \, A_j \bar{N}(A_j) - v(\bar{N}(A_j))\big].$$

Hence,

$$\hat{S}_t \approx (1-\beta\theta) \frac{\bar{m}}{\bar{x}} \sum_{s=0}^{\infty} (\beta\theta)^s \left(\hat{\lambda}_{t+s} + \hat{a}_{t+s} \right), \qquad \bar{m} \equiv \mathbb{E}\big[\bar{\lambda} \, \bar{A} \, A_j \bar{N}(A_j)\big]. \tag{47}$$

With constant Frisch elasticity disutility, $v(N) = \kappa \frac{N^{1+\psi}}{1+\psi}$, we have $v'(N)N = (1+\psi)v(N)$.

Using the steady-state optimality condition $v'(\bar{N}) = \bar{\lambda}\,\bar{A}\,A_j$ we obtain

$$\bar{x} = \mathbb{E}[v'(\bar{N})\bar{N} - v(\bar{N})] = \psi\,\mathbb{E}[v(\bar{N})], \qquad \bar{m} = \mathbb{E}[v'(\bar{N})\bar{N}] = (1+\psi)\,\mathbb{E}[v(\bar{N})],$$

and thus $\bar{m}/\bar{x} = (1+\psi)/\psi$. Equation (47) therefore simplifies to

$$\hat{S}_t = \frac{1+\psi}{\psi}(1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s\left(\hat{\lambda}_{t+s} + \hat{a}_{t+s}\right). \tag{48}$$

Under perfect foresight, the expectations operator is redundant for aggregate paths.

Log-linearizing Equation (13) Equation (13) relates the match value $V_{j,t}$ to match value added $S_{j,t}$ with a constant wedge σ:

$$V_{j,t} = S_{j,t} - \sigma.$$

In partial equilibrium $V_{j,t} = V_t$ and $S_{j,t} = S_t$. Let $\bar{V} \equiv \bar{S} - \sigma$ denote the steady-state value. Taking a first-order approximation around steady state gives

$$dV_t = dS_t,$$

so the log deviation of V_t is proportional to the log deviation of S_t:

$$\hat{V}_t \equiv \log\left(\frac{V_t}{\bar{V}}\right) \;=\; \frac{dV_t}{\bar{V}} = \frac{dS_t}{\bar{V}} = \frac{\bar{S}}{\bar{V}}\frac{dS_t}{\bar{S}} = \frac{\bar{S}}{\bar{S}-\sigma}\,\hat{S}_t. \tag{49}$$

Thus, compared to $\hat{S}_t$, movements in $\hat{V}_t$ are amplified by the factor $\bar{S}/(\bar{S}-\sigma)$, which is larger when the logit wedge σ is quantitatively important.

Log-linearizing Equation (8) We now log-linearize the worker value definition, Equation (8). Under perfect foresight we can drop the expectations operator for aggregate paths, but we keep $\mathbb{E}[\cdot]$ for idiosyncratic productivity realizations.

Insert $W_t(N) = (1+\hat{\xi}_t)\frac{\bar{P}}{\bar{\lambda}}v(N) + W_t^0$ into Equation (8) (suppressing the j index in partial equilibrium):

$$\begin{aligned}
V_t &= \sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}\frac{W_t(N_{t+s|t})}{P_{t+s}} - v(N_{t+s|t})\right] \\
&= \sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}\frac{W_t^0}{P_{t+s}} + \left((1+\hat{\xi}_t)\frac{\bar{P}}{\bar{\lambda}}\frac{\lambda_{t+s}}{P_{t+s}} - 1\right)v(N_{t+s|t})\right] \\
&= \sum_{s=0}^{\infty}(\beta\theta)^s\mathbb{E}_t\left[\lambda_{t+s}\frac{W_t^0}{P_{t+s}} + \left(\hat{\xi}_t + \hat{\lambda}_{t+s} - \hat{p}_{t+s}\right)v(N_{t+s|t})\right]
\end{aligned}$$

In steady state, $\bar{V} = \frac{\bar{\lambda}}{\bar{P}} \frac{\overline{W^0}}{1-\beta\theta}$. Since $\left(\hat{\xi}_t + \hat{\lambda}_{t+s} - \hat{p}_{t+s}\right)$ is already first order, we can replace $v(N_{t+s|t})$ by its steady-state value inside the expectation, $\mathbb{E}[v(N_{t+s|t})] = \bar{v}$, without affecting the first-order approximation. Taking a first-order approximation around steady state then yields

$$\hat{V}_t = \hat{w}_t^0 + (1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s\left[(1+\chi)\left(\hat{\lambda}_{t+s} - \hat{p}_{t+s}\right)\right] + \chi\hat{\xi}_t, \tag{50}$$

where $\hat{w}_t^0 \equiv \log(W_t^0/\bar{W}^0)$ and

$$\chi \equiv \frac{\bar{v}}{(\bar{\lambda}/\bar{P})\bar{W}^0}, \qquad \bar{v} \equiv \mathbb{E}\big[v(\bar{N}(A_j))\big]\,.$$

Solving for $\hat{w}_t^0$ and $\hat{\omega}_t^0$ We can now solve for the log deviation of base pay, $\hat{w}_t^0 \equiv \log(W_t^0/\bar{W}^0)$, by combining Equations (50), (49), and (48).

First, use the definition of the contract slope, $\hat{\xi}_t = (1-\beta\theta)\sum_{k=0}^{\infty}(\beta\theta)^k(\hat{p}_{t+k} - \hat{\lambda}_{t+k})$, to simplify (50). This yields

$$\hat{V}_t = \hat{w}_t^0 + (1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s(\hat{\lambda}_{t+s} - \hat{p}_{t+s}),$$

so the auxiliary parameter χ drops out. Therefore,

$$\hat{w}_t^0 = \hat{V}_t - (1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s(\hat{\lambda}_{t+s} - \hat{p}_{t+s}). \tag{51}$$

Second, substitute $\hat{V}_t = \frac{\bar{S}}{\bar{S}-\sigma}\hat{S}_t$ from (49) and $\hat{S}_t$ from (48). This yields

$$\begin{aligned}
\hat{w}_t^0 &= (1-\beta\theta)\sum_{s=0}^{\infty}(\beta\theta)^s\left[\left(\frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi} - 1\right)\hat{\lambda}_{t+s} + \frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi}\,\hat{a}_{t+s} + \hat{p}_{t+s}\right]. & (52)\\
&= (1-\beta\theta)\left[\left(\frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi} - 1\right)\hat{\lambda}_t + \frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi}\,\hat{a}_t + \hat{p}_t\right] + (\beta\theta)\hat{w}_{t+1}^0 & (53)
\end{aligned}$$

Define the (log) real base pay as $\hat{\omega}_t^0 \equiv \hat{w}_t^0 - \hat{p}_t$. Using $\hat{w}_{t+1}^0 = \hat{\omega}_{t+1}^0 + \hat{p}_{t+1}$ and $\pi_{t+1} \equiv \hat{p}_{t+1} - \hat{p}_t$, we can rewrite (53) recursively in terms of real base pay:

$$\hat{\omega}_t^0 = (1-\beta\theta)\left[\left(\frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi} - 1\right)\hat{\lambda}_t + \frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi}\,\hat{a}_t\right] + (\beta\theta)\hat{\omega}_{t+1}^0 + (\beta\theta)\pi_{t+1}. \tag{54}$$

Finally, define the (log) *cumulative* real base pay across contract vintages as the θ-weighted average of vintage-specific real base pay:

$$\hat{\omega}_t^{0,cum} \equiv (1-\theta)\sum_{s=0}^{\infty}\theta^s\hat{\omega}_{t-s}^0. \tag{55}$$

This object obeys the familiar Calvo recursion

$$\hat{\omega}_t^{0,cum} = (1-\theta)\hat{\omega}_t^0 + \theta\,\hat{\omega}_{t-1}^{0,cum}. \tag{56}$$

Combining (56) with the vintage recursion (54) delivers a closed difference equation for $\hat{\omega}_t^{0,cum}$. First, rewrite (56) as

$$\hat{\omega}_t^0 = \frac{\hat{\omega}_t^{0,cum} - \theta\,\hat{\omega}_{t-1}^{0,cum}}{1-\theta}, \qquad \hat{\omega}_{t+1}^0 = \frac{\hat{\omega}_{t+1}^{0,cum} - \theta\,\hat{\omega}_t^{0,cum}}{1-\theta}.$$

Insert these expressions into (54). Let

$$\kappa_\lambda \equiv \left(\frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi} - 1\right), \qquad \kappa_a \equiv \frac{\bar{S}}{\bar{S}-\sigma}\frac{1+\psi}{\psi}.$$

Then $\hat{\omega}_t^{0,cum}$ satisfies

$$(1+\beta\theta^2)\hat{\omega}_t^{0,cum} - \theta\,\hat{\omega}_{t-1}^{0,cum} - \beta\theta\,\hat{\omega}_{t+1}^{0,cum} = (1-\theta)(1-\beta\theta)\left(\kappa_\lambda\hat{\lambda}_t + \kappa_a\hat{a}_t\right) + (1-\theta)\beta\theta\,\pi_{t+1}, \tag{57}$$

or, equivalently,

$$\hat{\omega}_t^{0,cum} = \frac{\theta}{1+\beta\theta^2}\hat{\omega}_{t-1}^{0,cum} + \frac{\beta\theta}{1+\beta\theta^2}\hat{\omega}_{t+1}^{0,cum} + \frac{1-\theta}{1+\beta\theta^2}\left[(1-\beta\theta)\left(\kappa_\lambda\hat{\lambda}_t + \kappa_a\hat{a}_t\right) + \beta\theta\,\pi_{t+1}\right]. \tag{58}$$

How to check this: Either use Equation (56) with the vintage recursion Equation (54) in Dynare, or use Equation (58).

Variable pay compensation Nominal variable pay compensation for vintage t is given by $\hat{w}_{s|t}^{var} = (1+\psi)\hat{n}_{s|t} + \hat{\xi}_t$.

We have $\hat{a}_s + \hat{p}_s = \hat{\xi}_t + \psi\hat{n}_{s|t}$ by firm optimality, or $\hat{n}_{s|t} = \psi^{-1}(\hat{a}_s + \hat{p}_s - \hat{\xi}_t)$. Substituting in yields $\hat{w}_{s|t}^{var} = \frac{1+\psi}{\psi}(\hat{a}_s + \hat{p}_s) - \frac{1}{\psi}\hat{\xi}_t$.

Aggregating over cohorts, we arrive at $\hat{\omega}_t^{var} = \frac{1+\psi}{\psi}\hat{a}_t - \frac{1}{\psi}\hat{\omega}_t^{all}$.

Total compensation In steady state,

$$V = \frac{1}{1-\beta\theta}(\lambda W^0/P), \tag{59}$$

$$V = S - \sigma, \tag{60}$$

$$S = \frac{1}{1-\beta\theta}(\mathbb{E}[\lambda A A_j N_j - \kappa N_j^{1+\psi}/(1+\psi)]), \tag{61}$$

$$\lambda A A_j = \kappa N_j^\psi. \tag{62}$$

Therefore, $N_j = \left(\frac{\lambda A}{\kappa}\right)^{1/\psi} A_j^{1/\psi}$,
$S = \frac{1}{1-\beta\theta}\frac{\lambda^{(1+\psi)/\psi}A^{(1+\psi)/\psi}}{\kappa^{1/\psi}}\frac{\psi}{1+\psi}\mathbb{E}\left[A_j^{(1+\psi)/\psi}\right]$

We therefore arrive at

$$W^0/P = \frac{\lambda^{1/\psi} A^{(1+\psi)/\psi}}{\kappa^{1/\psi}} \frac{\psi}{1+\psi} \mathbb{E}\left[A_j^{(1+\psi)/\psi}\right] - \frac{\sigma(1-\beta\theta)}{\lambda}$$

$$\mathbb{E}[W^{var}/P] = \frac{\kappa\lambda^{-1}}{1+\psi} \mathbb{E}\left[N_j^{1+\psi}\right] = \frac{\lambda^{1/\psi} A^{(1+\psi)/\psi}}{\kappa^{1/\psi}} \frac{1}{1+\psi} \mathbb{E}\left[A_j^{(1+\psi)/\psi}\right]$$

Total output is given by

$$Y = A\mathbb{E}\left[A_j N_j\right] = \frac{\lambda^{1/\psi} A^{(1+\psi)/\psi}}{\kappa^{1/\psi}} \mathbb{E}\left[A_j^{(1+\psi)/\psi}\right]$$

The markdown is given by

$$\mu = \sigma \frac{(1-\beta\theta)\kappa^{1/\psi}}{\lambda^{(1+\psi)/\psi} A^{(1+\psi)/\psi} \mathbb{E}[A_j^{(1+\psi)/\psi}]}.$$

That is, σ directly controls the markdown: the profit share (the markdown wedge) is

$$\frac{\Pi}{Y} = \frac{(1-\beta\theta)\sigma}{\lambda Y},$$

where we use that in this environment expected profits per match equal $(1-\beta\theta)\sigma/\lambda$ in steady state (the logit wedge in utility units converted to goods using λ and the Calvo survival factor). Equivalently, output can be decomposed into profits, base pay, and variable pay as

$$\begin{aligned}
Y &= \Pi + \frac{W^0}{P} + \mathbb{E}\left[\frac{W^{var}}{P}\right], \\
\Pi &= \frac{(1-\beta\theta)\sigma}{\lambda}, \\
\mathbb{E}\left[\frac{W^{var}}{P}\right] &= \frac{1}{1+\psi} Y, \\
\frac{W^0}{P} &= \frac{\psi}{1+\psi} Y - \frac{(1-\beta\theta)\sigma}{\lambda}.
\end{aligned}$$

Thus, for fixed technology and preferences, a larger σ lowers the labor share one-for-one by increasing monopsony rents (the markdown) and reducing the base-pay component of compensation.

We are now in a position to log-linearize total wage compensation.

$$\hat{\omega}_t^{tot} = \left(1 - \frac{1}{(1+\psi)(1-\mu)}\right) \hat{\omega}_t^{0,cum} + \frac{1}{(1+\psi)(1-\mu)} \hat{\omega}_t^{var}$$

D Proof of Proposition 3

Proof. The proof proceeds in three steps: we first show that the real rate rule induces a DAG structure that pins down output independently of prices and wages; we then show that cumulative price inflation equals cumulative wage inflation; and finally we compute cumulative wage inflation.

Step 1: DAG structure. Under the real rate rule, the Euler equation $\hat{y}_t = \hat{y}_{t+1} - (i_t - \pi_{t+1})$ simplifies to $\hat{y}_t = \hat{y}_{t+1} - \epsilon_t$. Iterating forward and imposing $\lim_{T\to\infty} \hat{y}_T = 0$:

$$\hat{y}_t = -\sum_{k=0}^{\infty} \epsilon_{t+k} = -\frac{\epsilon_0\, \rho_{mp}^t}{1-\rho_{mp}}. \tag{63}$$

In particular, $\hat{y}_t = 0$ when $\epsilon_0 = 0$. Output is determined without reference to any price or wage variable. Given $\{\hat{y}_t\}$, the NKWPC determines $\{\pi_t^w\}$, and the wage accounting identity determines $\{\pi_t\}$.

Step 2: Cumulative price inflation equals cumulative wage inflation. In each model the wage accounting identity takes the form $\pi_t = \pi_t^w + f(\Delta\hat{y}_t, \Delta\hat{a}_t)$ for a linear function f of first differences:

$$\begin{aligned} \text{EHL:} \quad & \pi_t = \pi_t^w - \Delta\hat{a}_t, \\ \text{Our model:} \quad & \pi_t = \pi_t^{all} + \psi\, \Delta\hat{y}_t - (1+\psi)\, \Delta\hat{a}_t, \\ \text{Dennery:} \quad & \pi_t = \pi_t^w + \psi\, \Delta\hat{a}_t - (1+\psi)\, \Delta\hat{y}_t. \end{aligned}$$

Summing each identity from $t = 0$ to ∞, the first-difference terms telescope:

$$\sum_{t=0}^{\infty} \Delta\hat{y}_t = \lim_{T\to\infty} \hat{y}_T - \hat{y}_{-1} = 0, \qquad \sum_{t=0}^{\infty} \Delta\hat{a}_t = \lim_{T\to\infty} \hat{a}_T - \hat{a}_{-1} = 0,$$

since the economy starts and returns to steady state. Therefore $\sum_{t=0}^{\infty} \pi_t = \sum_{t=0}^{\infty} \pi_t^w$ in every case.

Step 3: Cumulative wage inflation. In each model the NKWPC can be solved forward for $\pi_t^w = \pm\, \tilde{\gamma}(1+\psi) \sum_{k=0}^{\infty} \beta^k (\hat{y}_{t+k} - \hat{a}_{t+k})$, with a positive sign in EHL and our model and a negative sign in Dennery.

Monetary policy shock ($\hat{a}_t = 0$). Substituting Equation (63), in the EHL and our model:

$$\pi_t^w = \tilde{\gamma}(1+\psi) \sum_{k=0}^{\infty} \beta^k \hat{y}_{t+k} = -\frac{\tilde{\gamma}(1+\psi)\, \epsilon_0\, \rho_{mp}^t}{(1-\rho_{mp})(1-\beta\rho_{mp})}.$$

Summing over t gives $\sum \pi_t^w = -\tilde{\gamma}(1+\psi)\epsilon_0/[(1-\rho_{mp})^2(1-\beta\rho_{mp})]$. The Dennery formula follows by flipping the sign and replacing $\tilde{\gamma}$ with γ^D.

Productivity shock ($\epsilon_t = 0$, so $\hat{y}_t = 0$). In the EHL and our model:

$$\pi_t^w = -\tilde{\gamma}(1+\psi)\sum_{k=0}^{\infty}\beta^k \hat{a}_{t+k} = -\frac{\tilde{\gamma}(1+\psi)\,\hat{a}_0\,\rho_a^t}{1-\beta\rho_a}.$$

Summing over t gives $\sum \pi_t^w = -\tilde{\gamma}(1+\psi)\hat{a}_0/[(1-\rho_a)(1-\beta\rho_a)]$. Again, the Dennery formula follows by flipping the sign.

Applying Step 2 yields the stated formulas for cumulative price inflation in both cases. $\square$